XXVIII.—*Examination of Deep-sea Soundings; with Remarks on the Habit and Structure of the* Polycystina. By John Denis Macdonald, M.D., F.R.S., Staff-Surgeon, H.M.S. 'Lord Warden'*.

Vice-Admiral Sir H. R. Yelverton, K.C.B., having handed over to me a small bottle of deep-sea soundings, given to him by Staff-Captain Calver, of H.M.S. 'Porcupine,' with a short descriptive paper, I submitted it to microscopic examination, and obtained some interesting results.

It will be convenient to preface my own observations with a copy of the paper above mentioned.

Specimen of Soundings.

"*Position* .... Lat. 47° 35′ N., Long. 12° 15′ W.
"*Depth* ..... 2435 fathoms (3 statute miles).
"*Temperature* . Surface, 65°·5 F.; bottom, 36°·5 F.
"*Pressure* .... 457 atmospheres = 6855 lbs.
"*Time occupied.* Sounding, 3 hours.
" " Dredge-sinking, 2 hours.
" " Dredge-working, 2 hours.
" " Dredge-raising, 4 hours.

"The above pressure will be more readily understood when it is mentioned that a man of ordinary size would, at the foregoing depth, be subjected to a pressure equal to the weight of thirty goods trains loaded with pig-iron, with their engines and tenders included; and yet creatures of great beauty and delicacy live, move, and have their being in this vast depth.

"The specimen consists of fine calcareous mud with myriads of Globigerinæ and other Foraminifera."

It is quite true that "fine calcareous mud, with myriads of Globigerinæ and other Foraminifera" exist in the soundings in question; but on treating them with boiling nitric acid, a large amount of siliceous particles and mineral grit, intermixed with interesting Polycystina and Diatomaceæ, were brought into view after the destruction of the carbonate of lime.

List of Genera observed.

Diatomaceæ.	*Polycystina.*
Coscinodiscus.	Astromma.
Actinoptychus.	Podocyrtis.
Gallionella.	Eucyrtidium.
Surirella.	Stylodictya.
Synedra.	Dictyocha.
Navicula.	Lychnocanium.

* Communicated by the Director General of the Medical Department of the Navy.

Notwithstanding the evidence of excellent observers as to the pseudopodia and the locomotive properties of genuine Foraminifera, I can only say that, having from time to time submitted thousands of the living animals to close inspection, I have seen no evidence of the existence of pseudopodia, and perfect fixity has been the rule, either by a broad base or a pedicle. Indeed the place of attachment of the latter is usually distinctly apparent in the dead shells.

The echinated Globigerine forms are generally found in the free state, being often taken in the towing-net with the Thalassicollidæ or amongst the ingesta of *Salpæ* and other pelagic animals. After the death of the sarcode, these little shells gravitate to the bottom of the ocean, in company with the siliceous frustules of Diatomaceæ and the crystal domes, concentric spheres, and the diverse spicular and fenestrated framework of the Polycystina, which also enjoy a pelagic life. Thus organic and sedimentary particles commingle to compose incipient rocks, whose intimate structure at some remote period may be studied with interest by future geologists.

In *Acanthometra* the animal sarcode is deposited centrally, but at the same time superficially, around the conjoined bases of the radiating spines, through the tubular axis of which pseudopodial extensions of the sarcode may protrude. There are, however, some pedunculated forms (such as are often to be found attached to the keel of *Atlanta*, the shells of Pteropoda, and other pelagic bodies) with exceedingly delicate and imperforate spines radiating through a reddish-brown sarcode mass surmounting the pedicle (*Acanthometra*, young?).

Professor Müller describes the sarcode of the *Eucyrtidium* of Messina as an olive-brown four-lobed body occupying the dome or summit of the shell, through the fenestrations of which emerge fine pseudopodia like those of *Actinophrys*.

Many of the free Polycystina(?) taken in the towing-net exhibit a remarkable alliance with the Thalassicollidæ. Thus a sarcode body, in every particular resembling a single punctum of the *Thalassicolla punctata* of Huxley, or in some instances two or three such bodies, were included within a more or less open siliceous framework.

The genus *Dictyocha* is an example of this group, which I have little doubt should be referred to the Thalassicollidæ. It is certain, however, that they are at present confounded with the Polycystina in the well-known fossil gatherings from Oran, Barbadoes, and other places.

Of course, where concentric shells are formed at intervals, the mode of growth of the sarcode must be in all essential

particulars similar to that of the Foraminifera; but where this is not the case, it is simply continuous or only augmentative. Though our knowledge of the Polycystina is yet very limited, the two modes of growth here indicated suggest their distribution into two corresponding sections, thus:—

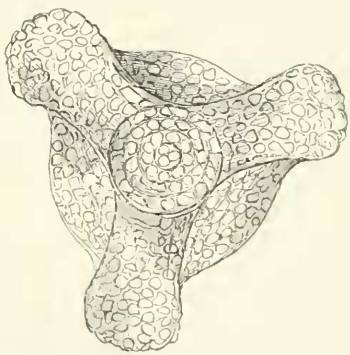
Polycystina.

Rhizopoda furnished with a siliceous spicular or fenestrated framework.

Growth of sarcode	Simple or continuous . .	*Acanthometra.* *Eucyrtidium.*
	By concentric accessions	*Stylodictya.* *Astromma.*

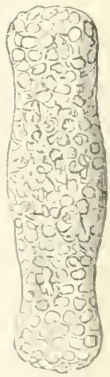
Now that the surface pelagic life of the Polycystina is a matter of fact, we can readily account for the occurrence of so many interesting forms in guano.

Fig. 1.



Front view.

Fig. 2.



Side view.

Astromma Velvertom.

Figs. 1 & 2 are respectively a front and a side view of a species of *Astromma* with three radiating lobes, *A. Aristotelis* having four. As the species appears to be new, I have named it *Astromma Velvertoni*.

H.M.S. 'Lord Warden.'
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